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FAO PLANT PROTECTION BULLETIN

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FAO Plant Protection Bulletin

Vol. I, No. 10 A Publication of the July 1953

World Reporting Service on Plant Diseases and Pests

Some Diseases of Economic Plants in Bihar, India

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The present notes, based upon observations made by the writers in 1952–53, report some diseases damaging economic plants, some of them not hitherto recorded in Bihar, a state in northeastern India.

Wilting of Gram

Considerable damage was inflicted on gram (*Cicer arietinum*) in some fields near Patna by a wilt disease. During the middle of February 1953 small patches of the plants were first seen turning yellow and wilting, and by end of March the disease had spread over the major portion of the field, killing nearly 70 percent of plants. Since the plants became affected at the time when the pods were just setting, the disease caused considerable reduction in yield. The causal organism was studied in artificial culture and was identified as *Operculella padwickii* Keshw. previously reported from Karnal, Punjab, as causing the same disease. There is no previous record of this disease in Bihar which has a large acreage under gram. The fungus never sporulates on the crop residue, though the mycelium could be recovered from any portion of the dead root tissues.

Burning of the crop residue and field sanitation to reduce the incidence of the disease are being studied.

Ozonium Wilt of Guar and Cucurbits

Ozonium texanum Neal & Wester var. *parasiticum* Thirum. has previously been reported as causing potato wilt in Bihar. In a field of guar (*Cyamopsis psoralioides*) near Kanke, Ranchi, nearly 40 percent of the plants wilted during the flowering stage due to the attack of the same fungus. The diseased plants were slightly stunted and showed yellowing of the lower leaves. The stem was covered and girdled at the collar region by white cottony strands of hyphae which penetrated through the host tissue directly and killed the invaded cells. The rhizomorphs produced had numerous cinnamon brown sclerotia.

Vines of *Cucurbita maxima* growing near Sabour were found to be killed also by this fungus, causing considerable damage. In one case, the fruit was attacked at the place where it was in contact with the ground. Strands of hyphae growing over the fruit surface at first caused water-soaked patches and later complete rotting of the fruit.

It is well known that the control of soil-borne sclerotia bearing pathogens is difficult. In the case of *Ozonium texanum* var. *parasiticum* it has been found that more frequent earthings by turning over the soil reduces the disease incidence. This is due to the fact that earthing breaks up the fungus colony before it mechanically penetrates into the host tissue and produces strands of rhizomorphs which have fan-shaped branching hyphae at the tip. When the colony is broken, the fungus, instead of regenerating and organising strands of hyphae again, has been in most cases found to produce sclerotia followed by collapse of the vegetative hyphae. Although the inoculum potential in the soil is not reduced, the growing plants may escape the disease.

Blast of Finger Millet

Eleusine coracana, known as finger millet, is an important crop in the Ranchi district, where a leaf blight and neck rot of the earheads caused by *Piricularia grisea* (Cke.) Sacc. was noticed. The losses ranged from 10 to 15 percent, mainly due to failure to form grains.

False Smut of Rice

Ustilaginoidea virens (Cke.) Tak. was found to be causing damage to rice in Islampur, Purnea, bordering Bengal State, where the disease is known to be severe. Survey in the western and northern parts of Bihar State, however, has not shown the occurence of this disease. *Entyloma oryzae* Syd. and *Neovossia horrida* (Tak.) Padw. & Azmatullah are rather common in the western part of the State.

Purple Blotch of Onion

Symptoms of severe scorching on some varieties of onion plants grown at the College of Agriculture, Sabour, were found to be due to *Alternaria porri* (Ell.) Neerg. The leaves were successively killed by necrosis and girdling of the fistular leaves, so that no bulb formation took place. The disease has not so far been observed in the indigenous red variety grown by the cultivators.

Oospora Rot of Citrus

Extensive losses of oranges and lemons usually occur in storage. Without cold storage facilities, oranges shipped from the hills packed with straw in bamboo baskets, when suddenly exposed to moist warm weather conditions, become very susceptible to infection. Mechanical injury of the skin also predisposes the fruits to attacks.

Among the organisms responsible for the wastage, *Oospora citri–aurantii* (Ferr.) Sacc. was found to cause a watery rot in oranges and lemons. The losses depended upon the condition of the fruit and the period of storage but was usually considerable. Externally the infected portion of a fruit appears water–soaked. On cutting the fruit, the diseased portion appears as a soft watery pulp. Fruits left overnight in humid atmosphere develop a white powdery surface due to the formation of conidial chains of the fungus, which are usually rubbed off with a piece of rag by the vendor before displaying the fruits for sale. All the other fruits, including the relatively healthy ones, are usually polished with the same cloth, which greatly facilitates the spread of the inoculum. Normally the stocks are sold out and consumed quickly before the manifestation of disease symptoms, but when the storage period lasts about a week considerable rotting of the fruit stocks takes place. In addition to sanitary handling of the fruits during transit and storage, other effective and practical control methods are being investigated.

Aster Yellows on Various Hosts in the United States

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SOME especially interesting recent reports of unusual plant disease occurrences involve the aster yellows virus, in the type (*Chlorogenus callistephi* Holmes, Callistephus virus 1 Kunkel ex K. M. Sm.), or the western strain (*C. callistephi* var. *californicus* Holmes, Callistephus virus 1A Severin ex K. M. Sm.).

Western Aster Yellows Virus in Gladiolus in Eastern States

Gladiolus corms received by Florida growers from southern Oregon occasionally produce a few plants with spindly, weak, yellow leaves and short thin roots, a condition referred to as "grassy–top" and "hairy–root".

This disease was first recognized in 1946 but attracted little attention until January 1952, when two Florida growers reported severe infection in about two–thirds of the plants in several acres of the Picardy variety. The corms had been grown during the previous season in southern Oregon.

The same Oregon source also supplied Hopman's Glory corms to a third Florida grower and Picardy corms to an Alabama grower. In the former case, about 3 percent failed to emerge and those that emerged showed symptoms of the same type as Picardy except that the growth was much weaker. In the latter, two–thirds of the plants from Picardy No. 2 corms were affected but very few from No. 1 corms, though both were harvested from the same planting. This suggests that corm size is reduced by first–season infection.

Discoloration or degeneration of vascular tissue was found near the base of all affected corms. In cross section, the core was larger and more irregular in shape than that of healthy corms of similar size. The storage tissue at the basal part of the corms was pale in color, coarse in texture, and bitter–tasting in comparison with healthy tissue. The base of the core was rough, hard, and black in many cases. Root traces were dark–colored and prominent and extended rather deeply into the corm. A few weeks after planting, small dark–colored warts were found on some corms which had developed small additional buds along the nodes.

Shoots from diseased corms of Picardy lived only two or three weeks in the field and were continuously replaced with weaker shoots. After two months, few shoots grew more than three inches long. Root growth became weaker and sparse, but corms remained alive until harvest, five months after planting. Plants that were normal in January appeared healthy at harvest.

In January 1952, nine corms of Oregon–grown Picardy from a lot that had developed the disease in Florida plantings were sent to the Plant Industry Station, Beltsville, Maryland, for diagnosis. Of these, two produced plants showing the typical grassy–top symptom, but only one survived until September. From the last the six–spotted leafhopper, *Macrosteles fascifrons* (Stal) (= *M. divisus* Uhl.), transmitted aster yellows to five of ten China asters and to four of five healthy Picardy gladiolus test plants. The virus was further transmitted from the infected China asters to one of six zinnias and to four of five celery plants. Zinnias displayed vein–clearing, rosetting, proliferation of lateral shoots and green flowers; celery showed yellowing, dwarfing, and stiff, upright, twisted leaves. Infection of zinnia and celery indicates the presence of the western strain of aster yellows virus, since these plants are known to be immune from the strain found in much of eastern United States.

Symptoms developed in the experimentally infected Picardy gladiolus are of special interest. Inoculated 7 April to 9 May, when 8 to 10 inches tall, by 16 May these

plants showed yellowing, bleaching and drying of the youngest leaf at the site of leafhopper feeding, immediately above the juncture with the next older leaf. These inoculated leaves subsequently turned completely yellow and withered. The plants made no growth after inoculation. By 20 June the older leaves had turned dull yellow, closely simulating the leaf symptoms of fusarium yellows. On 8 July the four affected plants were dead, the old corms were soft and depleted, and new corms and contractile roots were lacking. Thus aster yellows virus induces a lethal disease in gladiolus when plants become infected in the early stages of growth. Infected plants that survive to the following season, and then express the symptoms known as grassy–top presumably must have been inoculated in later stages of growth.

In April 1952, a Florida grower supplied additional corms of Oregon–grown Picardy thought to be affected with grassy–top. Of 182 corms planted in the greenhouse only one produced a normal plant. All others expressed grassy–top. The grower thus had made a nearly perfect separation of diseased corms from a mixture with normal ones on the basis of the warty appearance associated with development of additional lateral buds. On 9 July the grassy–top plants had many sprouts with thin yellowish leaves 6 to 12 inches long. The one normal plant developed a single shoot 36 inches tall but failed to flower.

On 18 April the Oregon grower supplied us twenty–three Picardy corms of unselected stock similar to that sold to the Florida growers. Thirteen of these produced normal single shoots and flowered 15 July at a height of 36 to 40 inches. The remaining ten plants developed three to seven shoots per corm with thin yellowish leaves 6 to 10 inches long. The disease tends to be self–eliminating, but many of the affected plants are able to persist weakly for four to eight months or possibly longer under glass.

There was no evidence of spread of the disease in Florida. No definite symptoms were observed in wild hosts or weeds examined. No leafhoppers known to be vectors were found in the area near Palmetto in April or July.

Aster yellows has been recognized previously in gladiolus. The type strain in the East has been experimentally induced in gladiolus by leafhopper transmission. Here too the experimentally produced symptom was a " grassy–top " in the second season, but the leaves were green in contrast to the marked yellowing caused by the western strain. Symptoms of the disease in gladiolus on the Pacific Coast were first reported in 1952. The losses in Florida in 1953 apparently represent the first outbreak of aster yellows as a gladiolus disease of economic importance.

Previously disease incidence had been seen to range from a trace to 2 percent in Oregon. As a disease of gladiolus, aster yellows may assume a minor role except under special weather conditions, such as severe drought that forces the leafhopper vector to congregate on irrigated gladiolus.

The chief importance of the introduction of western aster yellows in gladiolus to the eastern United States lies in the menace to celery and zinnia in areas where only the eastern strain of the virus is known to occur. Neither strain of the virus is known to occur in southern Florida; so introduction of diseased plant material should be avoided if at all possible. Celery has been free from aster yellows in the Eastern States as this crop is immune from the type strain of aster yellows already established. Zinnia, which escapes yellows in the Eastern States for the same reason, is widely grown by amateurs who have abandoned China aster.

Strawberry a Host of Western Aster Yellows Virus

In early attempts in California to transmit western aster yellows virus from celery and asters to wild strawberry, *Fragaria californica*, with four species of leafhopper vectors, one plant of eight inoculated developed symptoms but efforts to recover the virus to celery or aster were not successful.

In 1950 experiments, three plants of a runnerless strain of Alpine strawberry, *Fragaria vesca* var. *americana*, and two each of *F. vesca* (East Malling clone), *F. bracteata* (Sonoma clone), and *Erodium moschatum* (whitestem filaree) were inoculated by aster leafhoppers, *Macrosteles fascifrons*, reared on

infected asters. One plant of *F. bracteata* developed disease symptoms after an incubation period of 27 days while all other inoculated plants remained symptomless. In another test four Alpine strawberry and two whitestem filaree plants were inoculated by leafhoppers reared on infected celery.

One Alpine plant developed disease symptoms after an incubation period of 25 days. The virus was recovered from this plant by previously non-infective aster leafhoppers and transmitted to healthy broad-leaved plantain, *Plantago major*, plants which developed symptoms typical of western aster yellows, but not to healthy filaree.

The two experimentally infected strawberry plants developed symptoms typical of those caused by the aster yellows virus on other host plants. The first evidence of infection consisted of very mild vein clearing and a general chlorosis of the affected leaf. The disease rapidly increased in severity, causing development of adventitious crowns and chlorotic leaves and petioles progressively reduced in size until they became very minute shortly before the plants died. Leaflets exhibited upward or downward cupping and some petioles were twisted or curved and tended to assume a horizontal position.

During 1952 a disease with symptoms suggestive of aster yellows was noted to be common but not abundant in commercial strawberry plantings over widely scattered areas of central California. In one planting somewhat less than 5 percent of the plants showed the disease but in most fields only an occasional diseased plant was found. For the most part, the disease was found only in plantings of the variety Lassen.

The most diagnostic characteristic of the disease in the field was phyllody of the flowers, a symptom typical of aster yellows. On individual plants, depending on the stage of symptom development and even on a single inflorescence, the degree of phyllody varied from a mere virescence of petals to a condition in which a single flower resembled a gall or tight rosette of dwarfed green abnormal foliage. On all plants showing phyllody, foliage symptoms were also present including vein yellowing, general chlorosis of varying shades of pale green, yellowish or reddish, upward cupping, curvature and twisting of petioles, and an upright brittle stiffness. Plants were sometimes very stunted with greatly reduced leaves and shortened petioles. However, aphid-transmitted strawberry viruses could also be recovered from most plants tested by means of the strawberry aphid, *Capitophorus fragaefolii* (Ckll.), and since some of these viruses may cause similar foliage symptoms it is not known to what degree they were responsible for the foliage symptoms observed on the plants with phyllody. Aphid-transmitted viruses are not known to cause phyllody in *Fragaria*, however. In the field, plants showing phyllody appear to be self-eliminating, as they die within a few weeks or are so obviously abnormal that they are rogued out.

On different occasions and from several localities, plants showing floral phyllody were transplanted from the field into pots and brought into the greenhouse. In every case these plants died within two months. At the same time, other plants showing only foliage symptoms were similarly transplanted. Only a few of them subsequently developed phyllody and all of these died within a short time.

Aster yellows virus was recovered from field plants with phyllody symptoms but not from field plants showing foliage symptoms thought possibly to be caused by aster yellows but without phyllody.

It has not thus far been possible to distinguish the foliage symptoms caused by the aster yellows virus on strawberry from those produced by some of the aphid-borne viruses. Only the flower symptoms at present are recognized to be diagnostic for aster yellows.

Aster yellows will probably not become important on strawberries in California unless newly-developed varieties show greater susceptibility, because floral phyllody and foliage symptoms, as described above, have been observed on strawberry varieties and in seedling test plots only on rare occasions over the past 20 years. On celery and other host plants, western aster yellows has long been prevalent and of economic concern, and at least several of the more than 20 species of leafhoppers reported to be vectors of the virus are not uncommon in strawberry plantings. Greenhouse and field ob-

servations, however, indicate that *Fragaria* plants are not very favorable either as food or breeding hosts of the leafhopper species considered to be the most important vectors of western aster yellows.

A chlorotic phyllody disease of strawberry described from Louisiana in 1951, said to be suggestive of aster yellows in its symptomatology, resembles the western aster yellows disease reported here. Both cause seemingly identical symptoms, are apparently lethal, have a limited host range among commercial strawberry varieties, and are of minor importance in the areas where they occur. It appears possible that the clorotic phyllody disease may in fact be caused by a strain of the aster yellows virus.

As far as known, this is the first record of a leafhopper-borne virus affecting strawberry, and the first time that a virus occurring in nature in commercial strawberries has been identified as a virus previously known on host plants other than *Fragaria*.

Malformation of Carnation Blossoms

A malformation of the blossoms of the carnation variety Hercules has been observed recently in commercial greenhouses in the Denver and Colorado Springs areas in Colorado. The plants on which the malformation occurred showed symptoms of streak. It has been demonstrated that streak is caused by the aster yellows virus, but there has been no description of blossom damage by this virus.

The malformation is first expressed in unopened buds by pinched and tight calices on which the normal tipped peak is missing. Upon opening, the calyx appears to have been gnawed, the segment tips being indistinct. Its length is approximately one-half that of a normal calyx. The affected blossoms themselves are somewhat stunted.

Approach grafts, between ten affected and ten normal Hercules plants showing no streak symptoms, resulted in the production of bud and blossom symptoms in each case when average daytime greenhouse temperatures exceeded 80° F. Streak symptoms developed on all plants showing bud malformation. Check plants grafted to normal plants showed no symptoms.

Infected plants produced malformed blossoms only as long as daytime greenhouse temperatures remained abnormally high. Bud initials formed after daytime temperatures were decreased to 70° F. produced normal blossoms.

When ten normal plants each of White Sim and Miller's Yellow carnations were grafted to streak infected Hercules plants, no malformation resulted at either 70° or 80° F. daytime temperatures. It is concluded that the bud malformation was due to a varietal expression of aster yellows, influenced by high temperatures.

Insects and Diseases Affecting some Crops in El Salvador[1]

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Insects on Cotton

THE Mexican boll weevil, *Anthonomus grandis* Boh., is the most serious pest of cotton in El Salvador.

Investigations on the biology and habits of this insect, carried out during the last two years, have shown that the weevil does not estivate or hibernate but continues to feed and reproduce throughout the year. Every month of the year adults and larvae were observed and collected in the field. Of a total of 4,000 weevils collected late in January and February 1952 and held in cages under various conditions for hibernation or estivation, none survived to the end of the dry season in May or June. Information on alternate host plants has not been obtained, but it appears that there must be some host other than cotton, inasmuch as the boll weevil appears in any small planting of cotton no matter how far removed from other cotton plants. Control of the boll weevil in El Salvador is difficult because of frequent, almost daily, rainfall during the cotton growing season.

A second insect pest afflicting cotton is the bollworm, *Heliothis armigera* Hübn., which reproduces throughout the year in El Salvador. Control of this insect is usually integrated with the control of the boll weevil. Observations and experimental data indicate that the bollworm would be substantially controlled by its natural enemies were it not necessary to apply insecticides for controlling the boll weevil. Data so far obtained are not conclusive but bollworm infestations have been very light in check plots and in fields where little or no insecticide has been applied.

However, where heavy application of insecticides have been made to control the boll weevil, it has often been necessary to make further applications against the bollworm even though the boll weevil infestation remained slight.

The cotton leafworm, *Alabama argillacea* Hübn., also frequently invades the cotton fields. This pest multiplies very rapidly and often causes a great deal of damage before its presence is detected. It usually makes its appearance in large numbers late in the season before the cotton crop is mature.

Another cotton pest, *Sacadodes pyralis* Dyar, was discovered in El Salvador for the first time in January 1953. It is hoped that it will not become established in the principal cotton-growing areas.

Insects on Coffee

The coffee cricket, *Idiarthron subquadratum* S. & O., was the most serious insect pest of coffee during 1951 and 1952. This insect lays its eggs in the soil, at a depth of one to three inches, from August to December. The eggs lie dormant during the dry spell and start hatching about ten to fifteen days after the rains begin in the following April or May. There is only one generation per year. The most efficient and effective method of control consists of light applications of insecticides at eight- to ten-day intervals during the period when the nymphs are emerging from the soil. In 1952, in areas where such applications were made, excellent control was obtained at

[1] A contribution from the Centro Nacional de Agronomía, a technical agricultural service organization for El Salvador, operated jointly by the Government of El Salvador and the Foreign Agricultural Service, United States Department of Agriculture. United States participation in this work has been carried out as part of the Point IV Program in El Salvador, administered by the Technical Co-operation Administration, United States Department of State, through the Institute of Inter-American Affairs. The senior author is Entomologist, Foreign Agricultural Service, assigned to the Centro Nacional de Agronomía.

low cost. Natural parasites also play an important part in checking the infestations. A hymenopterous parasite, probably a new species of *Platypatasson*, parasitizes a high percent of the eggs of the cricket.

Mealybugs, *Pseudococcus brevipes* Ckll. and *Pseudococcus* sp., attack the roots of coffee plants. At present, damage appears to be limited to small areas. Some trees are killed by attacks but normally trees are only weakened or stunted and many appear to recover completely.

Insects of *Hemiceras* spp. are serious defoliators of the Inga shade trees in coffee plantations, affecting quite large areas each year.

Another defoliating insect, *Hemerocampa* sp., attacks and defoliates the coffee shade tree, madrecacao (*Gliricidia sepium*). In many years it affected large areas. The cocoons found on many coffee trees as well as on the shade trees are covered with larval hairs or spines, which are very irritating to the skin and annoy pickers at harvest time.

A weevil, *Epicaerus capetillensis* Sharp, has been abundant in one coffee plantation of about 60 acres, destroying the margins of about 30 percent of the coffee leaves.

This weevil lays its eggs in small crevices in wood or possibly other materials. After hatching, the larvae enter the soil, where they develop.

Coffee Diseases

Damping–off, caused by *Rhizoctonia solani* Kühn, attacks coffee seedlings at the time of germination or as soon as the plants appear above the ground. The first symptom is a small dark spot at the base of the stem where it is in contact with the ground. This spot continues to increase in size until it completely encircles the stem. When the disease reaches this stage, the plant is so weakened at its base that it falls to the ground. With optimum temperatures and humidity, this fungus spreads very rapidly from one plant to another along the row. From the row it spreads out in circular or irregular spots to adjacent rows. When the attack is severe, all plants in the seedbed may be destroyed. Seedbeds attacked by this fungus should be sprinkled with a suitable fungicide in order to destroy the fungus completely before any plants are removed for transplanting. Otherwise, plants that appear to be healthy at time of transplanting may carry the infection to the new area.

A root rot caused by *Fusarium* sp. attacks one– or two–year–old coffee trees. The fungus penetrates the ends of the rootlets and advances toward the main root and stem of the plant. The first symptom of the attack is a yellowing of the lower leaves; as the disease advances, this discoloration progresses upward. Infected leaves are shed within a short time, and soon only a sparse foliage remains on the top branches of the plant.

Black root rot due to *Rhizoctonia* spp., is considered the most serious disease of coffee trees in El Salvador. It has been associated with all samples of root rot injuries. The infected trees show a rapid yellowing of leaves and eventually complete defoliation. When affected trees are pulled out of the ground, the soil adheres to the collar region of the root because the intricate twining of the mycelium binds soil and root together in a mass. Examination of the cambium reveals a reddish brown discoloration.

Recently a few cases of what appears to be *Rosellinia* root rot have been reported on coffee in El Salvador. The disease is characterized by fanlike groups of mycelia in the cambium of the root.

Some of the principal foliage diseases of coffee in El Salvador are Cercospora spot (*Cercospora coffeicola* Berk. & Cke.), anthracnose (*Colletotrichum coffeanum* Noack, thread blight (*Pellicularia koleroga* Cke.) and the American leaf disease (*Omphalia flavida* Maubl. & Rangel).

The American leaf disease, known locally as ojo de gallo, is the most important foliage disease of coffee in the country. This disease, characterized by light–colored spots that completely cover the leaves in cases of heavy infection, causes severe defoliation, especially during the rainy season. On the fruits it produces dark sunken spots. The coffee berries may fall as a result of either the action of the fungus on the fruits or the weakening of the tree by defoliation. Stripping of diseased leaves by hand, applying copper sprays, and pruning the coffee shade

trees to permit better ventilation reduce the damage.

Insects on Other Crops

The fall armyworm, *Laphygma frugiperda* S. &. A., has been a serious pest on maize in El Salvador during the last two years. Damage has been most severe during the dry season, in areas where maize is grown under irrigation or in areas where the water table is high enough to supply moisture. Control of this insect, wherever effected, has been very costly.

Pepper weevil, *Anthonomus eugenii* Cano, is very destructive to peppers. It destroys from 75 to 95 percent of the crop if control measures are not employed. Satisfactory control has been obtained but the insecticides used, such as toxaphene and chlordane, are dangerous unless proper precautions are taken to prevent contamination of the harvested crop.

A rhinoceros beetle, *Rhynchophorus palmarum* L., attacks the coconut palm and other palms. Considerable damage has been observed in various plantings. No adequate control measures have been found.

TITLES SELECTED

No. 1.

The desert locust situation
Potato blight in Chile
Progress in plant protection in India

No. 2.

The locust problem in Central America and Mexico
Pineapple diseases and pests in Mexico
Insect problems in Nicaragua

No. 3.

The migratory locust in South America
Plant disease situation in the United States
Two important tree borers in Israel

No. 4.

Disease outbreaks on economic plants in Italy
Major pests of crops in Afghanistan
Wheat rusts in Spain in 1952

No. 5.

International Plant Protection Convention: its history, objectives and present status
Plant disease situation in the United States
Virus diseases of cereals in Canada

No. 6.

Plant disease situation in the United States
A foliar disease of legumes in Central America
International Wheat Rust Conference

No. 7.

Plant pathology in Colombia
Control of olive fly in Israel

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Plant disease situation in the United States
Apple leaf-curling midge, a new pest in New Zealand
Turnip mosaic of swedes in Eastern Canada

No. 9.

Observations on the Mediterranean fruit fly on citrus in Tripolitania in 1952-53
Plant disease problems in Central America

The sections "Outbreaks and New Records" and "Plant Quarantine Announcements" which appear in each issue, contain information on the incidence and spread of destructive plant pests and diseases, and most recent plant quarantine regulations, covering wide geographic range.

FROM PREVIOUS ISSUES

Outbreaks and New Records

Denmark

ERNST GRAM
Statens Plantepatologiske Forsög, Lyngby

Control of Apple Rubbery Wood

RUBBERY wood, characterized by a lack of lignification in the wood fibers and vessels, is a graft–transmissible virus disease affecting some varieties of apples. It has been shown in the East Malling Research Station that the virus is carried by several of the apple root–stocks which are propagated vegetatively.

As rubbery wood is increasing in certain apple varieties in Denmark, the National Committee for Propagation and Sanitary Inspection of Horticultural Plants has invited nurseries specializing in the production of apple root–stocks to send one layer from each of their mother plants to a control field established on the experimental station Blangstedgaard. Here the layers will be budded with a variety especially susceptible to this disease. Indexing is carried out in such a way as to permit the discarding of infected mother plants as symptoms appear in the control field.

A collection of selected typical and healthy mother trees of important varieties of apple, pear, and plum has been established at the experimental station at Hornum by the National Committee in co–operation with the Nurserymen's Association. From this collection, grafting and budding material will be provided for the detection of rubbery wood as well as other virus diseases of fruit trees.

Israel

Plant Protection Division,
Ministry of Agriculture, Jaffa

The following notes cover the incidence of major plant pests and diseases during the period from October 1952 to April 1953.

Citrus

The warm weather in autumn and winter, prevailing high day temperature and lack of rainfall, increased the population of citrus pests, mainly the citrus black scale (*Chrysomphalus aonidum* L.) and the Mediterranean fruit fly (*Ceratitis capitata* Wied.). Control measures against the black scale were carried out until the middle of November. Altogether 30,000 dunams (1 dunam = 0.1 hectare) were sprayed with mineral oils.

The fall population of the Mediterranean fruit fly was continuously on the increase until the end of December, heavily infesting grapefruit and Shamouti orange. After obtaining excellent results with ethylene dibromide at the laboratory, large scale fumigation of the fruit was achieved with a mixture of ethylene dibromide and nitrogen trichloride gas (trade name Decco) which is generally used for preventing fruit rots. Ethylene dibromide, at 7.5 gm. per cubic meter, added to the normal dosage of nitrogen trichloride killed 95 to 98 percent of living larvae in packed boxes after 2 hours of exposure.

Field experiments on the control of the fly with methoxychlor emulsion at the rate of 2 kg. per dunam were carried out in different localities, on a total area of 3,000 dunams. In a citrus grove of 30 dunams at Hazor, two treatments in autumn reduced

the infested fruits to 0.41 percent, and one treatment to 8.17 percent, in contrast with 81.7 percent in the check plot.

Citrus rust mite, *Phyllocoptruta oleivora* (Ashm.) Banks, was also prevalent till the end of November.

Other Fruit Trees

Apple trees were actively attacked by the wood–boring larvae of the leopard moth (*Zeuzera pyrina* L.) during the autumn and early winter. In some groves, the attacks were regarded as the worst in recent years.

A leaf–eating caterpillar (*Acronycta rumicis* L.), which seems not to have been recorded as a pest on crops, caused considerable damage to pear trees in a few orchards.

Considerable build–up of the population of the olive scale, *Parlatoria oleae* Colvée, on Japanese plums was reported. In Israel, this scale is hitherto known as a pest of economic importance only on apples.

The plum saw wasp (*Hoplocampa flava* L.) first appeared in the indicator box in northern Galilee on 23 March. A treatment with the wettable powder of BHC succeeded in preventing damage to young fruits.

The recently introduced long-horned beetle (*Batocera rufomaculata* de Geer) was found to be far more widespread than had been anticipated. Isolated fig trees were found damaged from lower Galilee and Gilboa mountains in the north and northeast down to the central Sharon in the south. An eradication campaign is under way.

The date palm scale, *Parlatoria blanchardi* Targ., was found to infest young palm plantations to a considerable extent. Winter spraying with oils gave promising control when carried out with high pressure spraying equipment.

Vegetables

Insects continuously attacked irrigated vegetables as a result of the mild climatic conditions. Many diseases, however, appeared late in the season and the autumn crops were harvested without any significant losses due to diseases.

The pest causing greatest injury to vegetables during autumn and winter was the mole cricket (*Gryllotalpa gryllotalpa* L.), which appeared in a dense population and completely destroyed the crop in some localities. Poison baits were rather effective in controlling limited outbreaks, but could not destroy a large population. Large scale field experiments on soil treatment with BHC, lindane and aldrin were carried out. BHC at the rate of 1½ to 2 lb. gamma isomer per acre gave the best results but its phytotoxic effect and tainting limit its use. Aldrin gave satisfactory control of the cricket when applied in two treatments at a fortnight's interval, at the rate of 2 lb. of the active ingredient per acre for each.

Onions were subject to the attack of a number of pests and diseases. The onion maggot (*Hylemia antiqua* Meig.) was the most injurious to young onions in seed–beds or after being transplanted into fields. Onion growers were very alert in carrying out preventive measures; but, in areas where such measures were neglected, 40 to 60 percent of the young onions were found damaged. Young plants were also heavily attacked by onion thrips (*Thrips tabaci* Lind.) which were successfully controlled by spraying with chlordane and dieldrin. From January onwards the plants were badly infected by downy mildew, *Peronospora destructor* (Berk.) Casp., causing considerable damage.

The cabbage aphid (*Brevicoryne brassicae* L.) appeared in October and had been prevalent on crucifers until January. Three to four treatments with nicotine compounds were required to control it. On turnip and radish grown for seed production, a heavy outbreak occurred of white rust, *Albugo candida* (Lév.) Kunze.

The cotton worm (*Prodenia litura* F.) attacked mainly beets and tomatoes. During the winter the powdery mildews (*Oidiopsis* and *Oidium*) were severe on tomatoes, peppers and carrots. Treatments with sulphur gave good control.

Spring potatoes, when regularly sprayed, could be kept free from late blight disease, *Phytophthora infestans* (Mont.) D By. Some damage was noted in fields where no control measures were taken. In the Jordan Valley, where very early sowings coupled with late rainfall rendered treatments difficult, the disease developed rapidly, reaching epidemic proportions in March. The yields were reduced from 15 to 20 percent.

Winter Cereals

Losses due to insects were negligible in winter cereals, during the period under review. The leaf miner (*Syringopais temperatella* Led.) was very rare. The Chrysomelid beetle (*Marseulia dilativentris* Reiche) was limited to fields in the northern part of the country causing only negligible damage. Neither pest developed extensively due to the unfavorable prevailing weather conditions.

Forage Crops

Vetches were attacked in the winter by aphids and later by larvae and weevils of the genus *Hypera*. *Vicia sativa* proved more susceptible to these insects than *V. atropurpurea*. The larvae of *Hypera* were also found on other leguminous crops, among which fenugreek (*Trigonella foenum-graecum*) was the most heavily attacked.

Fodder beets sown after July in the Negev harbored adult weevils of *Lixus junci* Boh. during all the winter months. Egg-laying and larval development took place in hot days. Observations indicate that the larvae can develop even in winter if temperature is high enough and the leaves are in the right stage of development. The weevils apparently prefer to lay eggs in the stalks of mature leaves.

Netherlands New Guinea

H. W. Moll

Service for Economic and Technical Affairs. Hollandia

Control of Coreid Bug

Riptortus sp. (Coreidae) was observed in soybean reserves near Manokwari and Ransiki in March and April 1953. Good control would be obtained by spraying or dusting DDT, but heavy rainfall in Manokwari diminished the effects of the insecticide, thus slightly increasing the damage. In the Ransiki plain the smallholders hesitated to apply DDT, resulting in a serious loss of the crop. The Agricultural Extension Service is taking steps to stimulate the use of this insecticide.

Soybean varieties with black seed are more resistant to this insect than the varieties with yellow-white seed.

White Grubs Damaging Crops

A species of white grubs, *Exopholis hypoleuca* Wied., was reported from the Merauke area in the southern part of New Guinea, damaging groundnuts and citrus trees. The beetles also attacked banana and coconut trees, but inflicted no serious damage.

New Zealand

Horticulture Division, Department of Agriculture, Wellington

Looper Caterpillar Declines

The control of the looper caterpillar (*Selidosema suavis* Butler) which was reported in the previous issues of this Bulletin as a serious pest of *Pinus radiata* in Canterbury, was effected by aircraft application of DDT in February 1953. The epidemic declined in April and May.

New Records

Helminthosporium leaf blight on maize. *Helminthosporium turcicum* Pass. has not been previously recorded in New Zealand but has evidently been present undetected for some time.

Chrysanthemum midge. *Diarthronomyia chrysanthemi* Ahl. on chrysanthemums has been found for the first time.

United States

Bureau of Entomology and Plant Quarantine,
United States Department of Agriculture

Severe Outbreaks of Armyworm

One of the worst outbreaks of the armyworm (*Pseudaletia unipuncta* Haw. = *Cirphis unipuncta* Haw.) to occur in several years was experienced in several states of the United States during late May and early June, 1953. By the middle of June, the outbreaks were beginning to subside. Over 500,000 acres in the State of Tennessee were infested and the outbreak was described as the worst since 1931 in Kentucky. Other states reporting serious outbreaks were Mississippi, Missouri, Illinois, Indiana, Ohio, Pennsylvania, and Maryland. Small grains, forage crops and young maize were under attack.

Rice Leaf Miner in Central California

An unusual flare–up of the leaf–miner, *Hydrellia griseola* (Fallen), on rice in the central valleys of the State of California occurred during early June. This flare–up seemed closely associated with the cool moist weather which was favorable for the insect and adverse to rice. Attack appeared to be more or less restricted to deep water plantings and foliage resting on the surface of the water. Over 80,000 acres of rice in localized areas had been subjected to control measures by 8 June, 1953. Similar outbreaks of this insect were experienced in California in 1922 and 1949 when weather conditions were similar to those experienced this season.

PLANT QUARANTINE ANNOUNCEMENTS

Denmark

Regulations concerning the importation of plants, parts of plants, etc., dated 27 April 1953, replace and consolidate into one document all the previous regulations relating to the importation of elm, Douglas fir, potato, barberry, and plants in general. These regulations, which came into force 1 July 1953, contain the following more important provisions.

Prohibited diseases and pests. Any plants or parts of plants are prohibited importation into Denmark if infested with the following dangerous diseases or pests:

Spindle tuber and other viroses in potato;
Peach yellows and other viroses in stone fruit;
Phloem necrosis and other viroses in elm;
Rubus stunt and other viroses in raspberry, blackberry and other species of *Rubus*;
Yellow edge (*Fragaria virus* 1) and other viroses in strawberry;
Stunt and other viroses in chrysanthemum;
Lettuce mosaic (*Lactuca virus* 1);
Oak wilt (*Chalara quercina*);
Dutch elm disease (*Ophiostoma ulmi*);
Potato wart (*Synchytrium endobioticum*);
Red core (*Phytophthora fragariae*) in strawberry;
Poplar canker (*Septoria musiva*);
Potato root nematode (*Heterodera rostochiensis*);
Colorado beetle (*Leptinotarsa decemlineata*);
San José scale (*Aspidiotus perniciosus*);
Japanese beetle (*Popillia japonica*);
Woolly aphis (*Schizoneura lanigera*);
Cherry maggot (*Rhagoletis cerasi*);
Fall webworm (*Hyphantria cunea*).

The term "other viroses" is used in order to avoid the necessity of changing the text of the Regulations every time a new destructive virosis of a specified plant is discovered; it is not expected that any Inspection Service can offer a complete guarantee against, *e. g.*, any latent viroses.

Prohibited imports. The following plant materials are prohibited entry into Denmark:

1. Elm (*Ulmus* spp.), including seed, bark and unstripped trunks;
2. *Berberis* spp. that are not permitted to be cultivated in Denmark, and grafted barberry and barberry seed of any species;
3. *Prunus americana* and *P. virginiana*;
4. All stone fruit seeds: seeds of European origin may be exempted by permission of the Danish Plant Inspection Service;
5. Oak (*Quercus* spp.) and Chinese chestnut (*Castanea mollissima*), including seeds: seeds of European origin may be exempted;
6. Mould, compost and stable manure;
7. Living insects (excluding bees), and fungi and bacteria pathogenic to plants: bees are subject to special legislation;
8. Hosts of San José scale, including plants, parts of plants and grafts from countries or, by special provision, localities where this pest has been found within a certain period prior to the importations. A list of 41 genera of woody plants which are regarded as hosts of this scale is annexed to the regulations.

Imports conditionally restricted. The plant materials specified below may be introduced on condition that they are accompanied by a health certificate issued by the official plant inspection service in the country of origin, that a permit has been obtained from the Danish Plant Inspection Service, and that entry into Denmark is through the following customs houses: Aalborg, Aarhus, Copenhagen, Esbjerg, Gedser, Kolding, Odense, Padborg and Tonder. The health certificate should be in the form given in the International Plant Protection Convention, 1951, in the language of the exporting country and in English, French or German. An invoice copy, carrying the stamp and signature of the inspection service, should be fixed to the certificate. On the back of the certificate a summary of the Danish requirements for the entry of the materials involved must appear, unless a notification has been accepted by the Danish Plant Protection Service guaranteeing that the inspector concerned is acquainted with the requirements. The issue of the permit may be subject to specific conditions, such as inspection, quarantine or disinfection.

1. *Potatoes.* Seed potatoes, as a rule, may be imported only by state institutions and national growers organizations, subject to specific restrictions. Table potatoes will be permitted importation, in special cases only, between 1 January and 1 June and on condition that the locality of origin is free from major potato pests and diseases and is situated at least 5 km. from localities infested by potato wart within the preceding 12 years and by Colorado beetle and Japanese beetle within 2 years. The consignment must be

sorted and packed in new containers at a special grading depot or at the harbour, and sample-inspected prior to dispatch.

2. *Trees, shrubs, and other nursery stocks, including all materials used for propagation.* The growing place must have been found free from dangerous pests and diseases (the absence of potato root nematode shall have been proved by analysis of earth samples) and must be at least 5 km. from any locality infested by potato wart within the preceding 12 years and by Colorado beetle, Japanese beetle or San José scale within 2 years. The consignment should be sample-inspected before dispatch. With the exception of budsticks, and conifers and other Gymnosperms, such plants and parts thereof may not be imported between 1 April and 30 September. All host plants for San José scale must be fumigated, even from non-infested countries. Exemptions may be granted.

3. *Flower bulbs, corms and tubers.* Importation shall require field inspection and sample inspection as in the case of trees, shrubs and nursery stocks.

4. *Rooted vegetables, and lettuce and cauliflowers.* Importation may take place only from 1 November to 1 April.

5. *Lettuce seed.* The field of origin must be found free from lettuce mosaic by inspection during the growing season.

6. *Potted plants as household goods and alpine plants as traveller's luggage.* A health certificate is not required but a permit must be obtained prior to entry.

Imports unrestricted. The following plant materials may be imported without a health certificate if free from the designated pests and diseases: fruit, vegetables without roots (except lettuce and cauliflower), seed (except when prohibited or restricted), osmund roots, and cut branches, leaves and flowers for decoration.

Packing materials. Hay, straw, grass, potato haulms, and used sacks must not be used as packing for plants to be imported.

Regulations concerning the export of plants and parts of plants were also issued 27 April 1953 and came into operation 1 May 1953.

Greece

Law 2147 of 3 June 1952 concerning the prevention and control of insects and plant diseases and the organization of the Plant Protection Service was published in the Government Gazette Vol. 1, No. 155, 5 June 1952. All previous laws and decrees on plant protection are thereby abolished.

By this law the Minister of Agriculture is authorized to issue decrees regulating import, export and domestic trade of plants and plant products as well as any other carriers of plant pests and diseases, and to designate inspectors, ports of entry, etc. The Ministry is also to carry out and enforce special anti-pest campaigns, to regulate the sale and use of pest control materials, and to control the production of plants with reference to combating harmful insects and diseases.

The Law contains general provisions regarding the organizational structure, including personnel and monetary provisions, and defines terms to be used in subsequent Decrees thereto.

United States

Foreign Plant Quarantines No. 59 relating to flag smut disease and No. 69 relating to packing materials were revised and amended respectively by order of 6 May 1953, published in the Federal Register Vol. 18, No. 90, 9 May 1953. The revision and amendment became effective 8 June 1953.

The revised Flag Smut Quarantine prohibits the importation into the United States (including Virgin Islands) of wheat grain and wheat products, except flour and other products which have been so milled or processed as to have destroyed all spores of the flag smut (*Urocystis tritici*), from the following countries or territories:

> Aden Protectorate, Afghanistan, Australia, Bulgaria, Caucasus, Chile, China, Cyprus, Egypt, Germany, Greece, India, Iran, Iraq, Israel, Italy, Japan, Netherlands, Oman, Pakistan, Palestine, Portugal, Saudi Arabia, Sinai Peninsula, Spain, Syria, Trans-Jordan, Tunisia, Turkey, Union of South Africa, Yemen.

Products which are permitted importation from the countries and territories specified above include:

> 1. wheat products of the milling process that have been milled or processed as to have destroyed all flag smut spores (excluding wheat flour which is not subject to this quarantine);
>
> 2. wheat straw, hulls and chaff, and seeds of *Melilotus indica* and other field crops that have been separated from wheat during the screening process: these products, in compliance with the requirements for permits and notice of arrival, shall be treated upon arrival by 5 percent ethyl mercury phosphate dust or other means equally effective, or shall be processed or utilized as authorized by the inspector at an approved mill or plant.

The Packing Material Quarantine, as amended, excepts from its provisions wheat straw, hulls and chaff used as packing materials, when imported subject to the revised Flag Smut Quarantine from countries and territories specified above.

NEWS AND NOTES

Indonesia Becomes Party to the International Plant Protection Convention

The Government of Indonesia, whose representative signed the International Plant Protection Convention on 6 December 1951, has notified the Director-General of FAO that the signature of its representative is not subject to ratification. Indonesia, therefore, becomes a party to the Convention, together with the following fourteen countries: Australia, Austria, Belgium, Cambodia, Ceylon, Chile, Denmark, the Dominican Republic, El Salvador, India, Japan, New Zealand, Spain and Sweden.

International Meetings on Seed Testing

The Tenth International Seed Testing Convention and Triennial Meeting of the International Seed Testing Association were held consecutively in Dublin, 25–30 May 1953.

The Convention, held during the first three days, was mainly devoted to the presentation and discussion of technical papers on all aspects of seed testing, including examination of seed samples for seed-borne diseases. It was attended by 135 delegates and observers from 22 countries, and representatives of three international organizations, including FAO, the International Seed Trade Association, and the European Plant Protection Organization.

The Meeting of the International Seed Testing Association, which followed the Convention, was attended by 33 official delegates from 20 countries and some 30 observers. The major accomplishment was the adoption of a revised version of the International Rules for Seed Testing, the present version of which dates back to 1937.

In the new Rules, which will come into force in the southern hemisphere on 1 January 1954 and in the northern hemisphere on 1 July 1954, the section on sanitary conditions of seed is more comprehensive than in the present version. The importance of inspecting seed for seed-borne diseases, pests and other conditions of health, with special reference to quarantine treatments, is specifically emphasized. Examinations for seed-borne diseases etc. are to be carried out only on request by the sender and are to be restricted to such specific diseases as requested. The model phytosanitary certificate set forth in the International Plant Protection Convention is adopted for this purpose, with specific diseases to be covered indicated in the additional declaration. Certificates referring to freedom from seed-borne diseases in general are not to be issued. A basic list of the more important seed-borne diseases is appended to the Rules, including information on methods by which the presence of such diseases may be determined.

The desirability of preparing a comprehensive manual on seed-borne diseases, based upon recent advances of knowledge in this field, was discussed but, owing to the high printing cost involved, no decision was taken.

Roma - Tip. del Senato del dott. Giovanni Bardi

CEREAL BREEDING PROCEDURES

Recently published, this FAO Development Paper covers the whole field from the hybridization of the parent plants until a new variety is in commercial production. Methods of growing hybrid populations, systems of testing and recording of results, variety purification and increase of pure seed, as well as the analysis of data, are treated in detail. Various types of nurseries are described for the breeding of varieties resistant to plant diseases and insect pests, and tolerant to certain climatic factors such as frost.

Special features of the publication are the sixteen appendices which graphically illustrate planting plans, plot arrangements, the statistical progress of a cross, variety purification and other features of a cereal breeding program. The complexity involved in modern plant breeding methods and the consequent necessity of systematizing the procedures are clearly and impressively indicated. 122 pages, $1.25; 6/3.

LEGUMES IN AGRICULTURE

This unique collection of information on legumes, edited by R. O. Whyte, G. Nilsson-Leisner and H. C. Trumble, required the collaboration of specialists in every member country of FAO. No fewer than 111 contributors are acknowledged, and contributions from many more are mentioned in the text.

Nowhere else is such information available in one volume and, by pointing to the limitations in the data on economic botany, ecology and the biotic relationships of legumes it is hoped to encourage further research and experiment particularly in tropical and sub-tropical areas. An appendix tabulates the species, indicating plant characteristics, climatic adaptation, soil adaptation, utilization, number of seeds per pound and seeding rates in pounds per acre. 368 pp., many illustrations, $ 3.00; 15s.

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